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WO 2004/011903 A3

(54) Title: MONITORING MOLECULAR INTERACTIONS USING PHOTON ARRIVAL-TIME INTERVAL DISTRIBUTION ANALYSIS

(57) Abstract: A method for analyzing/monitoring the properties of species that are labeled with fluorophores. A detector is used to detect photons emitted from species that are labeled with one or more fluorophores and located in a confocal detection volume. The arrival time of each of the photons is determined. The interval of time between various photon pairs is then determined to provide photon pair intervals. The number of photons that have arrival times within the photon pair intervals is also determined. The photon pair intervals are then used in combination with the corresponding counts of intervening photons to analyze properties and interactions of the molecules including brightness, concentration, coincidence and transit time. The method can be used for analyzing single photon streams and multiple photon streams.

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/US03/23252

**A. CLASSIFICATION OF SUBJECT MATTER**

IPC(7) : G01J 03/30; G01N 21/64

US CL : 356/317; 250/459.1

According to International Patent Classification (IPC) or to both national classification and IPC

**B. FIELDS SEARCHED**

Minimum documentation searched (classification system followed by classification symbols)

U.S. : 356/317-318; 250/458.1-461.2

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)  
Please See Continuation Sheet**C. DOCUMENTS CONSIDERED TO BE RELEVANT**

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 6,137,584 A (SEIDEL et al.) 24 October 2000 (24.10.2000), column 1, line 54-column 4, line 25.	1-18
A	WO 99/21063 A1 (LLOYD et al.) 29 April 1999 (29.04.1999), page 5, line 10- page 12, line 8.	1-18

☐ Further documents are listed in the continuation of Box C.☐ See patent family annex.

\* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T"

later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X"

document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y"

document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&amp;"

document member of the same patent family

Date of the actual completion of the international search

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**INTERNATIONAL SEARCH REPORT**

PCT/US03/23252

**Continuation of B. FIELDS SEARCHED Item 3:**

EAST

Search Terms: arrival time, photon pairs, fluoresc\$, luminesc\$

INSPEC

Search Terms: arrival, photon pairs, photon stream, fluoresc\$, luminesc\$